Ref 7/D

1960 RC/4

REPORT OF THE

FIRST FAO/CCTA INTERNATIONAL MEETING ON BANANA PRODUCTION

Held in Abidjan
(Ivory Coast)
12-19 October 1960

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

COMMONWEALTH MYCOLOGICAL INSTITUTE
28 DEC 1961

Meeting Report
No. PL/11

REPORT

of the

FIRST FAO/CCTA INTERNATIONAL MEETING ON BANANA PRODUCTION

Held in

Abidjan, Ivory Coast

12-19 October 1960

Food and Agriculture Organization of the United Nations

November 1960 Rome (Italy)

61/C/2440

CONTENTS

	Page
INTRODUCTION	1
LIST OF PARTICIPANTS	2
Delegates from Member Countries	2
Observers	5
Conference secretariat	7
Officers of the meeting	8
ACKNOWLEDGEMENTS	9
RECOMMENDATIONS	10
I. Dissemination of information	10
II. Improvement of banana growing	10
III. Standardisation	11
IV. Handling and quality standards	11
SUMMARY OF DISCUSSIONS	12
Worldwide study of production of the table banana	12
Varieties, breeding and plant studies	13
Ecology	14
(a) Soil	14
(b) Climate	15
Cultural practices in plantations	16
(a) General	16
(b) Manuring	17
(c) Miscellaneous questions	18
Pest control	19
(a) Insects	19
(b) Nematodes	20
Disease control	20
(a) Panama disease	20
(b) Sigatoka (leaf spot) disease	21
(c) Bunchy top	22
(d) Other diseases	22
Transport and ripening of bananas	22
Miscellaneous items	23
DATE AND PLACE OF NEXT MEETING	23
LIST OF DOCUMENTS PRESENTED TO THE MEETING	24

INTRODUCTION

The First FAO/CCTA International Meeting on Banana Production, organised by the Food and Agriculture Organization of the United Nations in association with the Commission for Technical Cooperation in Africa South of the Sahara, was held at Abidjan from 12-19 October 1960, on the kind invitation of the Government of the Republic of the Ivory Coast.

The following countries participated in the Meeting: Brazil, France, German Federal Republic, Ghana, Israel, Italy, Lebanon, the Netherlands and Surinam, New Zealand (Western Samoa), Portugal, the Republic of the Cameroons, the Republic of the Congo (Brazzaville), the Republic of the Ivory Coast, the Republic of Guinea, Spain, the United Kingdom (South Cameroons). Observers were also present from the following countries: Republic of the Cameroons, German Federal Republic, France, India, Italy, Portugal, Spain, and from fourteen international organizations and various institutions.

The Meeting was opened by His Excellency M. Denise, Minister of State, who welcomed the Delegates on behalf of the Republic of the Ivory Coast. He drew attention to the contribution which inter-country consultations can make to the progress of national development.

On behalf of FAO and CCTA, Mr. G.J. Piquer thanked the Government of the Ivory Coast and the organisers, in particular the Ministry of Agriculture and Cooperation, the Chamber of Agriculture and Cobafruit, for the facilities and services which they had provided for the Meeting. He presented the apologies of the FAO Regional Representative for Africa, who was prevented from attending by other urgent work, and those of the representatives of the Banana Board of Jamaica, and of Mr. F.P. Pansiot, FAO Specialist in Horticulture, who could not attend the Meeting for health reasons.

The Closing Session of the Meeting was honoured by the presence of Mr. G. Monnet, Minister of Agriculture. After discussion of the recommendations, he emphasised the interest of meetings of this nature where research workers, technicians and processors can exchange ideas for better understanding and coordination of the various aspects of production and marketing. He also thanked FAO and CCTA for organising this important Meeting in his country.

LIST OF PARTICIPANTS

Delegates from Member Countries

BRAZIL

Mr. Jayme Vasquez Cortez, Engenheiro agronomo, Rua Braz Cubas 3/3°, Santos, Brazil.

FEDERAL REPUBLIC OF GERMANY

Mr. J. Abderhalden, Expert, Ziefen, Bâle, Switzerland.

Dr. Claas, Fa. Süddeutsche Kolbenbolzenfabrik, Stuttgart-Nord, Ehrenhalde, 11.

Mr. H. Ruck, Director of Terpal Chemie, Reimerstrasse 18, Hamburg.

FRANCE

Mr. J. Guilloteau, Head of delegation, Inspecteur général de l'Agriculture d'Outre-Mer, Ministère de l'Agriculture, Service de Coopération technique Outre-Mer, 57 Boulevard des Invalides, Paris 7ème.

Mr. E. Bulle, Directeur des Services agricoles de la Martinique, Fort de France, Martinique.

Mr. J. Champion, Chef du Service Banane, IFAC, 6 rue du Général Clergerie, Paris 16e.

Mr. R. Deullin, Ingénieur Frigoriste, IFAC, 6 rue du General Clergerie, Paris 16e.

Mr. P. Martin-Prével, Service de Physiologie végétale de l'IFAC, 6 rue du Général Clergerie, Paris 16ème.

GHANA

Mr. C.E. Tagoe, Head of delegation, Senior agricultural officer, Ministry of Agriculture, Cape Coast, Ghana.

Mr. J.E.M. Bartels, Economics Division, Ministry of Food and Agriculture, Accra.

Mr. G.K.A. Buahin, Agricultural officer (entomologist), Ministry of Agriculture, Scientific Services Division, P.O. Box 891, Kumasi.

Mr. K.K. Taylor, Principal Marketing Officer, P.O. Box 2309, Accra.

ISRAEL

Dr. Chanan Oppenheimer, Head, Division of Subtropical Horticulture, National and University Institute of Agriculture, Rehovot.

ITALY

Generale Domenico Fornara, Consigliere delegato, Azienda Monopolio Banane, via Amba Aradam 21, Rome.

LEBANON

Dr. Ramzi Khalidy, Assistant Professor of Horticulture, Faculty of Agriculture, American University of Beirut, Beirut.

THE NETHERLANDS AND SURINAM

Dr. D. Tollenaar, Head of delegation, Agricultural consultant, Merellaan 8, Bilthoven, Netherlands

Ir. W. Snoep, c/o A. van Hoboken and Co., P.B. 476, Rotterdam, Netherlands.

NEW ZEALAND (Western SAMOA)

Mr. B.E.V. Parham, Director of Agriculture, c/o Department of Agriculture, Apia, Western Samoa, South Pacific.

PORTUGAL

Mr. Alvaro Martins da Silva, Director dos serviços de Agricultura, Direcçao de Agricultura e Florestas, C.P. 250, Lourenço Marques, Moçambique.

REPUBLIC OF THE CAMEROONS

Mr. B. Ngila, Head of delegation, Chef de la division des statistiques agricoles au Ministère de la production rurale, B.P. 1073, Yaoundé.

Mr. H. Dina, Chef du Service de la Production, B.P. 1073, Yaoundé.

Mr. Guérout, Phytopathologiste à l'IFAC, B.P. 1740, Abidjan.

REPUBLIC OF CONGO (Brazzaville)

Mr. M. Brunet, Chef du 1er secteur agricole, Préfecture du Kouilou, B.P. 693, Pointe-Noire.

Mr. A. Loemba, Conducteur principal d'agriculture, B.P. 144, Pointe-Noire.

REPUBLIC OF GUINEA

Mr. B. Camara, Chef de la délégation, Directeur général de l'Office National de la Banane et des Fruits de Guinée, Conakry, B.P.613.

Mr. H. Auperrin, Directeur des Coopératives, B.P. 685, Conakry.

Mr. J. Brun, Directeur du Centre Guinéen de Recherches Fruitières, B.P. 36, Kindia.

Mr. K.A. Kourouma, Ingénieur agricole, Station de Recherches du quinquina, Sérédou, Macenta.

Mr. P. Macauley, Directeur de l'Union nationale des Coopératives de planteurs africains de Guinée, B.P. 913, Conakry.

Mr. G.F. Mathos, Directeur de la Caisse Nationale de Soutien de la Production, B.P. 108, Conakry.

REPUBLIC OF THE IVORY COAST

Mr. Charles Donwahi, Head of delegation, Secrétaire d'Etat à l'Agriculture, Abidjan.

Mr. J. Anoma, Ancien Ministre de l'Agriculture, Président du Syndicat Agricole Africain, Abidjan.

Mr. A. Assamoi, Conseiller technique à l'ASSABAF, Abidjan.

Mr. Bonjour, Président de la Cobafruit, B.P. 1550, Abidjan.

Mr. L. Brader, Entomologiste à l'ORSTOM, B.P. 20, Abidjan.

Mr. Chollet, Inspecteur général du Ministère de l'Agriculture, Abidjan.

Mr. R. Descleres, Président de la Chambre d'Agriculture et d'Industrie de Côte d'Ivoire, B.P. 1291, Abidjan.

Mr. P.L. Guimberteau, Agronome à l'IFAC, B.P. 1740, Abidjan.

Mr. M.L. Houillier, Spécialiste des questions phytosanitaires à l'ORSTOM, B.P. 20, Abidjan.

Dr. Konian, Président de la Caisse Nationale de Crédit Agricole, B.P. 1845, Abidjan.

Mr. Loubhouet, Député, Abidjan.

Prof. G. Mangenot, Directeur de l'IDERT à Adiopodoumé, B.P. 20, Abidjan.

Mr. P. Merle, Directeur de l'IFAC on Côte d'Ivoire, B.P. 1740, Abidjan.

Mr. Moity, Banana grower, Abidjan.

Mr. G R. Riou, Pédologue, Chargé de Recherches de l'ORSTOM, B.P.20, Abidjan.

Mr. J. Robin, Agronome à l'IFAC, B.P. 1740, Abidjan.

Mr. A. Sawadogo, Ingénieur agricole, Inspecteur à la Caisse Nationale de Crédit agricole, B.P.1845, Abidjan.

Mr. A. Vilardebo, Entomologiste nématologue à l'IFAC, B.P. 1740, Abidjan.

SPAIN

Mr. Jorge Menéndez Rodriguez, Ingeniero Jefe del Servicio agronómico de Santa Cruz de Tenerife, Jefatura agronómica, Santa Cruz de Tenerife, Islas Canarias.

UNITED KINGDOM (British Cameroons)

Mr. R.E.G. Burnley, Acting Principal Agricultural Officer, Agricultural Department, BUEA, Southern Cameroons.

Mr. D.C. Edgali, Coopt. Agric. Manager, B.C.U.F. Ltd., BUEA, Southern Cameroons.

Observers

FEDERAL REPUBLIC OF GERMANY

Mr. Willi Ganssauge, i/Fa. Afrikenische Fruchtcompagnie Laeisz and Co., Hamburg 11, Trostbrücke 1.

FRANCE

Mr. M. Barbier, Agronome à l'IFAC, B.P. 1740, Abidjan

Mr. F. Dugain, Maître de recherches à l'ORSTOM, Centre de Pédologie de Hann, B.P. 1386, Dakar, Sénégal.

Mr. P. Frossart, phytopathologist, IFAC, B.P. 36, Kindia, Republic of Guinea.

Mr. J. Monnet, Chef de la section de recherches sur le bananier de l'IFAC, 6 rue du Général Clergerie, Paris 16ème.

INDIA

Mr. Chattre Bhujanga Rao, Government Horticulturist to the Government of Andhra Pradesh, Hyderguda, Hyderabad.

ITALY

Dott. F. Bigi, Federazione Bananicoltori, Somalia, via Colonna Antonina 52, Rome.

PORTUGAL

Mr. Armindo Pena da Silva Cardoso, Missão de Estudos Agronomicos de Ultramar de Portugal, Rua Rodrigo da Fonseca, 103/4°, Lisboa.

Mr. Alberto dos Santos Oliveira, Ingénieur agronome des services officiels, Junta do Bengo, Luanda, B.P. 2491 C., Angola.

REPUBLIC OF CAMEROONS

Mr. P. Caplain, Administrateur du Syndicat des Planteurs, Penja, B.P. 3, Cameroun.

SPAIN

Mr. Jaime Nosti Nava, Jefe de la Sección de Investigaciones y Ensenânza, Departamento de Agricultura, Dirección de Agricultura, Madrid, Espana.

AMERICAN UNIVERSITY OF BEIRUT

Dr. Ramzi Khalidy, Assistant Professor of Horticulture, Faculty of Agriculture, American University of Beirut, Beirut.

CENTRE D'ETUDE DE L'AZOTE

Mr. J. Berger, Chargé de Mission, Centre d'Etude de l'Azote, Case Postale 69 Stand, Genève.

Mr. G. Knosp, Chef du Service Outre-Mer du S.P.I.E.A., 58 Av. Kléber, Paris 16ème.

COMITE INTERPROFESSIONEL BANANIER

Mr. E. Kilcher, Président de l'O.C.P., 3 rue Rossini, Paris.

COMMUNAUTE ECONOMIQUE EUROPEENNE (EUROPEAN ECONOMIC COMMUNITY)

Mr. Hans Ludolf von Kotze, Chargé de Mission, Commission de la CEE, 23 Avenue de la Joyeuse-Entrée, Bruxelles.

INSTITUT INTERNATIONAL DU FROID (INTERNATIONAL INSTITUTE OF REFRIGERATION)

Mr. R. Doullin, Ingénieur à l'IFAC, 6 rue du Général Clergerie, Paris 16ème.

INSTITUT INTERNATIONAL DE LA POTASSE

Mr. R. Oren, Head of Agricultural Technical Division, Pazchem Ltd., P.O.B. 1977, Tel Aviv, Israel.

Mr. J. Clauzet, Chargé de Mission, c/o Institut International de la Potasse, Case Postale Berne-Transit (Suisse).

INTERNATIONAL COOPERATION ADMINISTRATION (ICA)

Dr. Vining C. Dunlap, Consultant, c/o International Cooperation Administration, Washington 25, D.C.

INTERNATIONAL SOCIETY OF SOIL SCIENCE, and
INTERNATIONAL SOCIETY FOR HORTICULTURAL SCIENCE

Ir. Willi Snoep, c/o A. van Hoboken and Co., P.B. 476, Rotterdam, Netherlands.

SOUTH PACIFIC COMMISSION

Mr. B.E.V. Parham, Director of Agriculture, c/o Department of Agriculture, Apia, Western Samoa, South Pacific.

UNITED FRUIT COMPANY

Mr. Alfred F. Butler, Director, Changuinola Research Station, Panama, c/o Chiriqui Land Co., Almirante, Panama.

CYANAMID S.A.

Mr. Ricardo Cardeñosa-Barriga, Cyanamid de Colombia, S.A., Bogota, Colombia.

ELDERS AND FYFFES LTD.

Mr. G.C. Millensted, Department of Research, Elders and Fyffes Ltd., Likomba Plantation, Tiko, Southern Cameroons.

SANDOZ LTD.

Mr. P.E. His, Technical Adviser on Plant Protection Problems, Sandoz Ltd., Agrochemical Dept., Bâle, Switzerland.

Conference Secretariat

F.A.O.: (Food and Agriculture Organization of the United Nations)

Mr. G.J. Piquer, FAO Regional Horticulturist, FAO Near East Regional Office, P.O. Box 2223, Cairo, UAR Southern region.

Dr. A.L. Molle, UNSF Officer, Plant Production and Protection Division, FAO, Rome.

CCTA (Commission for Technical Co-operation in Africa South of the Sahara)

Mr. J. Champion, Chef du Service bananes, IFAC, 6 rue du Général Clergerie, Paris 16ème.

CHAMBRE D'AGRICULTURE ET D'INDUSTRIE DE LA COTE D'IVOIRE, B.P. 1291, Abidjan

Mr. J. Manet, Secrétaire général.

Mr. R. Bergier, Secrétaire général adjoint.

MINISTERE DE L'AGRICULTURE ET DE LA COOPERATION DE LA REPUBLIQUE DE COTE D'IVOIRE, Abidjan

Mr. G. Abitbol, Chef du Service de documentation et de propagande.

Mr. Aka Anghi, Bureau de Coordination des Instituts de Recherches.

Officers of the Meeting

Mr. Charles Donwahi, Secretary of State for Agriculture, head of the delegation of the Republic of the Ivory Coast, was unanimously elected Chairman, and Mr. Bonjour, Président of Cobafruit and Dr. Vining C. Dunlap (ICA) were elected Vice-Chairmen.

Messrs. G.J. Piquer (FAO) and J. Champion (CCTA) acted as Technical Secretaries.

ACKNOWLEDGEMENTS

The Delegates expressed their appreciation to FAO and CCTA for their initiative in organising the Meeting, and their thanks to the Government of the Republic of the Ivory Coast for the excellent hospitality which had been offered to them. They also expressed their thanks to the personnel of the Ministry of Agriculture and Cooperation, of the Chamber of Agriculture and of Industry of the Ivory Coast, and of Cobafruit, for the perfect organisation of the Conference and of the excursions.

The Delegates had the opportunity to visit the plant, equipment and banana quay of Cobafruit, and also the research station of the Institut Français de Recherches Fruitières Outre-Mer (IFAC) at Azaguié and the Institut d'Enseignement et de recherches tropicales at Adiopodoumé (Office de la Recherche Scientifique et Technique Outre-Mer). Excursions were also organised to plantations in the region of Nieky and Divo. In addition, the Delegates had an opportunity to visit the banana ship "Tarpon", the most up to date at present in service on the coast of Africa.

The Delegates were most interested by the exhibition of agricultural products of the Ivory Coast which was organised in the hall of the Chamber of Agriculture. They also attended the showing of a series of colour slides relating to the different aspects of banana production in the world.

RECOMMENDATIONS

I. Dissemination of information

The Meeting recognised the need for the promotion of closer international cooperation in banana research and for better contacts and exchange of information between research stations and banana workers in general, and

REQUESTED the Director-General of the Food and Agriculture Organisation of the United Nations and the Secretary-General of CCTA/CSA to

1. assist in the preparation and issuance of a world list of institutes and research stations, both governmental and private, and of persons working on banana investigations,

2. request the above-mentioned institutes and stations to nominate a person to be responsible for the dissemination of information,

3. contemplate the collection and dissemination of requests for information on banana problems to the above-mentioned persons, in order to maintain and strengthen the contacts made during this Meeting,

4. undertake the publication of a newsletter, whose frequency of issue will be determined later, and distribute it to the Governments and interested institutions and research workers. This newsletter could in particular disseminate information referred to in the previous paragraph,

5. promote contact between research specialists studying the problem of banana leaf analysis with a view to helping them compare their findings and agree on a common method of controlling the mineral nutrition of the banana plant,

6. contemplate the preparation of a list of references on the various aspects of banana growing, along the lines of analogous lists previously published for other crops by FAO,

7. request the Governments of the banana growing countries jointly to provide the financial support needed to enable a specialised institute to prepare and publish a colour atlas on the pests, diseases and deficiencies of bananas and the control methods known at present.

II. Improvement of banana growing

The Meeting, recognising the great possibilities for improvement of banana growing which were offered by selection work for resistance to disease and adaptation to adverse climatic conditions, and noting at the same time the considerable difficulties which have been so far encountered in obtaining resistant hybrids and also wishing for better dissemination of knowledge

regarding the ecology of the banana and the pests and diseases of this plant,

RECOMMENDED that the governments of the banana-growing countries should

1. organise systematic research for, and maintenance of, mutants, notably of the "Cavendish" group,

2. establish living collections of banana species and clones and promote the exchange of plant material which is free from pests and diseases, it being understood that each requesting government should provide for quarantine measures in respect of delivered material,

3. promote studies on banana ecology in order to evolve a better definition of optimum ecological conditions with a view to ensuring the protection of banana plantations from adverse climatic factors,

4. make a financial contribution to the publication by a specialised institute of the colour atlas referred to under item I.7.

III. Standardisation

The Meeting, recognising that differences in methods and reporting procedure among countries could lead to misunderstandings and mistakes, particularly as far as statistics, denomination of banana varieties and quality criteria are concerned,

RECOMMENDED that the Governments of the banana growing countries should:

1. seek to unify statistical reporting by expressing production and export data in terms of both stems and net weight,

2. undertake studies of banana varieties and types following an agreed description method, in order to make it possible to prepare a general list indicating the existing denominations and synonyms,

3. standardise as far as possible methods of measurement and analysis as regards quality, ripening and processing of banana fruits, in order to facilitate the interpretation of research work.

IV. Handling and quality standards

The Meeting, in the belief that it was essential if banana consumption were to increase, that highly attractive fruits endowed with good eating qualities be offered for sale at the retail stage, and considering that such high quality depended among other things on the condition of the fruit at the moment of loading as well as in the course of ripening,

RECOMMENDED that the exporting countries should

continue studying the most adequate methods of evaluating banana quality on loading in order that international handling and quality standards be drawn up as soon as possible.

SUMMARY OF DISCUSSIONS

Worldwide study of production of the table banana

The FAO Technical Secretary presented the problems relating to banana production in the world. He emphasized that production statistics (local consumption plus exports) were very incomplete and often incorrect, and that certain important local production did not appear in the world statistics. He summarized the documents on the world banana market prepared by FAO (Nos. 34 and 35) and demonstrated that the present tendency was towards expansion, as much in production as in consumption.

In the discussion which followed, the delegation of the Federal Republic of Germany stated that imports into that country for 1959 reached 430,000 tons which, for a population of approximately 51 million, gave an annual per caput consumption of about 18 lbs. He pointed out that in France the figure for 1959 was also about 18 lbs., which was almost up to the level of consumption in the United States.

The delegation of Spain indicated that total exports from the Canary Islands (Cavendish) which rose to 255,000 tons in 1955, reached 265,000 tons in 1959, and that it was expected to pass the figure of 300,000 tons in 1960. Half of these exports were consumed in the peninsula territory, representing 11 lbs. per person. Spanish Guinea produced 14,465 tons of 'Gros Michel' bananas which were exported to the United Kingdom and Europe.

The delegation of Ghana pointed out that the document indicated for their country a reduction (by weight) of exports between 1958 and 1959, whereas there was actually an increase of 50 per cent in the number of bunches exported in 1959 over 1958. It was difficult for the delegate of the British Cameroons to give the value in weight of his country's production, for this was always expressed in bunches and the weight of the bunches varied according to the season of the year.

It seemed obvious that the drawing up and interpretation of worldwide statistics were very much complicated by the diversity of methods used.

The observers from the German Federal Republic and the C.I.B. (Comité Interprofessionel de la banane) noted that from the economic point of view the trade and production sectors should take into account above all, the profitability, which depends in its turn on the possibilities of exporting at remunerative prices to the main markets, which are North America and Western Europe. During the last five years importation has increased in these countries, thus bringing about a fall in the selling price. The observers have noted that the Western European market, with a few exceptions (Italy), has arrived at saturation point, particularly if account is taken of the recent expansion of European fruit plantations, the effect of which will be felt strongly in the next few years.

Varieties, breeding and plant studies

Briefly introducing the subject, the CCTA Technical Secretary recalled the more common names of the cultivated varieties and clones, which he recommended should be adopted in place of the frequently used Latin binomials. He stated that in several parts of the world attempts had been made to replace the varieties being grown in order to obtain types resistant to the Panama and Sigatoka diseases, to eliminate wind damage, or simply to obtain bunches that could be transported lightly wrapped. He further stated that the 'Gros Michel' variety could be hybridized with diploid male parents but this possibility did not exist in the 'Cavendish' group. On the other hand, numerous mutations occurred in the latter and the isolation of these mutants could lead to interesting discoveries.

The New Zealand delegate introduced a paper (No. 4) by Mr. R.E. Osborne (Jamaica).

Mr. J. Monnet (IFAC) then gave the results of comparative trials on the main commercial varieties (paper No. 26).

During the discussion, the delegation of France observed that it would be useful to undertake systematic work for the prospection and maintenance of mutants.

The representative of the United Fruit Co. said that his Company had recently established 'Lacatan' plantations. At the same time, 'Gros Michel' mutations were systematically isolated, but they usually bore no fruit of commercial value and had no resistance to Panama disease. The United Fruit Co. had launched a hybridization programme with the 'Gros Michel' variety and begun exploring the Far East regions not studied by N.W. Simmonds.

On the subject of plant studies, Mr. J. Champion gave an account of some observations on the growth of the foliar system of the 'Poyo' variety of banana, and also summarized the data collected by Mr. Guyot on root emission at various stages of its growth (papers No. 27 and 37).

Several points were raised in the course of the discussion, in which the delegates and observers of Germany, Brazil, the British Cameroons, Ivory Coast, Spain, France, Israel and the United Fruit Co. took part.

In Israel, growers reduced the number of leaves to control the time of flowering. Physiological trials in the same field were now being carried out at the IFAC station in the Ivory Coast. It was also pointed out that root emission after shooting was completely lacking or considerably reduced.

Experiments with gibberellins in Guinea had shown depressing effects on plant growth.

The problem which caused most comments from delegates was that of wind resistance. The causes of falling plants were numerous. Firstly, the roots of the banana which were very tender were also extremely susceptible to infestation by parasitic nematodes; secondly, the corm could be partly destroyed by weevils; and lastly, the out-earthing process of the corm, in older plants, raised the corm clear of the ground; this caused the high lateral roots to dry out before reaching the soil.

By selecting deep suckers it was possible to prevent out-earthing to some extent; it was also possible to earth up or hoe the ground around the plant in order to stimulate rooting. Compactness of soil seemed to hamper root growth. In Israel particularly, the number of roots growing in artificially compacted soils was only one tenth of the average found under normal conditions. In the Santos area of Brazil, however, fifty-year old bananas thrived on soils consisting solely of clay and loam.

It was a well known fact that mulch will induce an upward growth of the roots towards the surface of the soil, which may increase the risk of plants falling. It appeared, however, that the latter could be prevented by bringing artificial manure to the soil at the right time.

Ecology

(a) Soil

Mr. F. Dugain, the rapporteur, showed by means of particular examples, that many soils possessed chemical characteristics favourable to banana growing and that these could also be improved more or less easily. It was difficult, however, to change unfavourable physical characteristics. After recalling that these - and notably the humus content - fluctuated very considerably at times, the rapporteur submitted papers by Mr. C.J. Jordine (No. 13) on banana soils in Jamaica and by Mr. N. Leneuf on banana soils in the Ivory Coast (No. 18), as well as a document (No. 20) on the peat soils of the Agnébi (Ivory Coast). He concluded by giving an account of his own research work on soil fertility in the plains in the Cameroons (Paper No. 8).

Various interesting points were raised by the delegates. None of the participants could offer instances of banana soils with a 35 per cent CaO content, such as were found in the Jordan Valley. In Guinea it had been observed that the yields increased as soil pH rose from 4.5 to 6.5. Above pH 6.5, no further gain resulted from the addition of lime. The delegate of Israel pointed out that a sharp decrease in the porosity of soil for air could induce a notable fall in yield as well as early yellowing of the plant. He concluded that heavy cultivation equipment should not be used. He also stated that although Israelian soils sometimes contained as much as 5.5 per cent of organic matter, with correspondingly high yields, the average for Israel was 2.5 to 3.0 per cent, which was closer to the figures usually observed in banana plantations on the coast of Africa. From his own experience, the rapporteur believed that it was difficult to increase these rates by bringing organic material to the soil although these notably affected yields.

The delegation of France raised the question of banana growing on saline soils. Mr. Moity stated that in the Benty Area of lower Guinea, polders had been established in slightly saline soils; the yields were satisfactory as long as no alum formed as a result of drainage and additions of potassium and ammonium salts.

Mr. J. Champion recalled that in Southern Ecuador (El Oro province) the variety 'Gros Michel' was grown on soil which was relatively saline, as evidenced by the fact that efflorescences appeared in the dry season. At that time of the year, leaf scorch was noticed but yields were high and fruit quality good.

Mr. Menendez Rodriguez stated that also in the Canary Islands leaf scorch was observed in those plantations set up on somewhat salty soil, although this leaf scorch disappeared after three or four years, when irrigated with sweet water.

In the Jordan valley, and in some places of the coastal area of Israel, irrigation water contains 300 p.p.m. of chloride, and no damage was noticed, so that Dr. Oppenheimer considered bananas not especially vulnerable to salt.

(b) Climate

Dr. C. Oppenheimer, rapporteur for this item, first recalled a few facts concerning the relationship of bananas to climate. The growth of the plant was continuous and no chilling period was necessary for its development. It seemed to be photoperiodically indifferent, and its suckers might suffer from excessive light intensities. Water requirements were from 5 to 10 mm. daily. In many instances the setting up of wind-breaks would be useful if the winds blow constantly from the same direction and are not too strong.

As regards temperature, the rapporteur thought that measurements taken in a standard meteorological screen were of little value as they gave indications which were too remote from the actual temperature in the different parts of the plant. The temperature of the highest leaves, which lost heat through radiation during the night, was close to the minimum grass temperature. On the other hand, temperatures within the pseudo-stems were close to those which prevailed 12 in. below ground level.

In this connection, Mr. J. Brun (Guinea) stated that during the dry season the temperature of the leaves in full sunlight could reach 104° F., there being practically no difference between the upper and lower faces. Internal temperature in the pseudo-stems could reach 95° F. under the same conditions.

Mr. J. Champion considered that in the tropical zone poor light conditions led to an increase in foliar area and to a decrease of the omission rate of the leaves.

At this point, some delegates with experience in tropical areas with a dry season disagreed, as regards the effects of air humidity on the growth of the banana, with the rapporteur who considered that this factor was unimportant so long as water requirements were met by irrigation. In his view, wind-breaks in the Near East were not sufficient to create microclimates with a high degree of air moisture.

Certain observations made on the climate of Middle Guinea, where the combined effects of drought and a certain fall in temperature increased the time lapse between flowering and harvesting, led Mr. Oppenheimer to remark that in this instance it was not known whether drought or cold was the determining factor.

In conclusion, Mr. J. Brun (Guinea) submitted observations made on bananas grown in the open in water culture. Although water availability was certainly sufficient, the rate of emission of the leaves noticeably slowed down during the period of severe drought between December and April, and this slowing down continued after the cold period from December to January. Shortly before the first rains, when air humidity started to increase again, foliar emission resumed its normal rate.

The rapporteur also summarized papers submitted by Messrs. V.R. Lumsden (No. 3), G.J. Piquer (No. 10), L.B. Thrower (No. 17), R. Khalidy (No. 24) and R.J. Ticho (No. 25). Finally he presented his study (No. 22) on the influence of climatic factors on banana growing in Israel. After a brief discussion on rainfall, humidity, light intensity and wind, a full account was presented on the influence of temperature on three points: damage due to low temperature in winter, influence of temperatures on flower differentiation and influence of temperature on time of fruit ripening.

Mr. J. Nosti (Spain) presented the climate section of his report (No. 45) on banana growing in Fernando Po. Mr. J. Menendez stated that in the Canary Islands the quantities of irrigation water applied per annum ranged between 12,000 and 15,000 cubic metres per ha, i.e., they were much below those applied in Israel. Dr. Oppenheimer stated that the amount of water given in the coastal areas of Israel was the same as that given in the Canary Islands, but in the Jordan valley, much higher quantities (25,000-30,000 m^3) were given, which is certainly too much. There is a tendency to reduce these figures.

Cultural practices in plantations

(a) General

Mr. A.F. Butler introduced the subject and presented a paper (No. 11) by Dr. N.C. Thornton on the management of 'Gros Michel' plantations. Mr. J. Monnet introduced three papers relating to the kinds of vegetable material for planting, the influence of planting holes and a trial in annual

cultivation (Nos. 28, 38 and 41). In answer to a question put by Mr. Desclercs (Ivory Coast), it was specified that this latter method was of particular interest to African growers since it would reduce considerably the need to treat for Cercospora leaf spot, when practised over sufficiently large areas. It could not, however, replace perennial cropping.

Mr. P. Merle pointed out to Mr. A.F. Butler that chemical weeding by the oily atomization of a mixture of P.C.P. and diuron had been evolved by IFAC in Martinique and was proving successful. In Israel, Simazine was being increasingly used.

(b) Manuring

Mr. P. Martin-Prével, rapporteur, introduced the subject under various headings, the first being the study of mineral deficiencies, illustrated in the report of Mr. F. Dugain (No. 7) on "le bleu" of the banana, which occurred due to imbalance between Mg and K. In this connection, Dr. Oppenheimer indicated the presence of Mg deficiency in plants growing on light soils in Israel.

No report had been submitted on a second aspect of the problem, i.e. the empirical establishment of manuring requirement by agronomic trials. Soil and plant analysis methods of determining banana plantation requirements were a third and fourth aspect of the problem and had been reported on by Mr. F. Dugain (No. 9), Mr. P. Martin-Prével and Mme. R. Tisseau (Nos. 39 and 40) and by Mr. D.E. Boland (No. 14).

Mr. F. Dugain (France - ORSTOM) stressed the soil/plant competition which takes place when large amounts of mineral fertilizers are applied. In the course of a trial, carried out according to the Homès method on a potassium-dominant plot, observations made at the end of a year had shown that 60 per cent of the added potassium had been retained in the soil, so that the amount of available potassium was no greater than that in the other plots. In reply to a delegate he pointed out that the apparent contradiction between two statements in report No. 9 was due to this phenomenon of soil/plant competition, since applications of organic matter could lead to an increase in yield, perhaps owing to the existence of hormone or vitamin substance, without any appreciable increase in humus content.

Dr. C. Oppenheimer described the investigations carried out in Israel particularly in the field of leaf analysis and on this point, Mr. P. Martin-Prével drew attention to the differences between countries and regions in sampling techniques and expressed the hope that, if possible, a common method might be established.

In reply to Mr. M. Moity, who wished to know why a section of the leaf blade had been chosen rather than any other part of the plant, it was stated that, whilst it was possible that another part of the plant might in some cases be more representative, the actual sampling and preparation of samples

raised practical problems. The method of sap analysis would appear to be less accurate because of the variations in composition which occur during the day. Similar variations which occur to a lesser degree in the leaf, were the subject of current experiments.

At present, the number of leaf blade sections taken as samples was between 25 and 30 but the statistical establishment of the most representative number of samples was being investigated.

(c) Miscellaneous questions

Mr. B.E.V. Parham (New Zealand) introduced Mr. M.E.A. Tai's survey on banana openhandedness (No. 6) and Mr. R. Khalidy submitted his report on banana cultivation in Lebanon (No. 24).

The delegate of Brazil gave some information on the techniques used in his country. The banana plantations there were to be found in a narrow coastal area, 300 kms. long, on either side of Santos, partly on slopes, partly on sedimentary plain. In the plain, the planting was done at 4 x 4 m. while in the mountainous regions it was done at 3 x 3 m., using a three followers system. Only mineral manuring was practised, using a 10-10-20 fertilizer. Although the maximum pH was only 5.2 lime applications did not seem to give any response, nor did organic matter. As in Jamaica, too much nitrogen led to excessively long bunches while balanced formulae gave compact bunches reaching 27 to 28 kgs. for 'Dwarf Cavendish'.

In some countries as far apart as Lebanon, the Canary Islands and Brazil, planting material was kept in the shade for about two weeks before being planted, a practice which promoted callusing and permitted a more rapid start of side buds. For other countries the best method was immediate planting.

Mr. J. Menendez in turn gave some details regarding banana cultivation in the Canary Islands. Here the soil sometimes had to be broken up with dynamite. The resulting stones were used to form the foundation of the terraces which were covered with 2 to 3½ ft. of soil, the latter sometimes having to be brought from a distance. The frequency of gusts of wind made it necessary to build hedges or walls as protection. The plantations are found from sea-level to an altitude of 800 - 1000 ft. The density of planting was 2,500 plants per ha. at sea-level and 1,400 plants per ha. in the hills. The low rainfall (300 mm. per year, which in the South dropped to 150 mm.) spread out over 3 or 4 months only made it necessary to ensure permanent irrigation and large-scale works were often necessary in order to procure water. It was hoped to save water by using sprinkling methods. Forty metric tons of manure per ha. per year were used, as well as 6,000 kgs. of 10-8-15 mineral fertilizer, of which 2,500 kgs. ammonium sulphate, 2,500 kgs. of 16 per cent superphosphate, and 1,000 kgs. of potassium sulphate. The reaction of the soil was neutral. Experiments on covering the soil with bagasse and vegetable waste had given satisfactory results.

The observer of India read out the paper on banana cultivation in the coastal region of Andhra Pradesh (No. 47).

Mr. D.C. Edgali (United Kingdom) in turn spoke about the way in which peasants, united in cooperatives, operated in the British Cameroons (document No. 2).

The delegate of Israel gave some additional data regarding density of planting which varied according to the richness of the soil. He stated that poor soil only yielded 1,200 bunches per ha. while the richer soils gave 2,500. Furthermore, he mentioned that experiments had been carried out on the influence of synthetic hormones on floral differentiation. The results had been negative but the problem of prolonging the juvenile stage was still under consideration. The banana was sometimes cultivated together with avocado. The results obtained by cutting the male part of the inflorescence seemed to show strong variations according to climatic conditions.

Post control

(a) Insects

The subject was introduced by Mr. A. Vilardebo, rapporteur, who drew attention to the fact that among animal pests, nematodes had recently come into prominence. He then requested the observer from the United Fruit Co. to introduce the document No. 12 prepared by Dr. N.C. Thornton regarding post control in Latin America and gave an outline of his own paper on banana weevil control (document No. 42). According to Mr. A.F. Butler, Bordeaux mixture treatment against Sigatoka had a repellant effect on young Caligo and Opsiphanes caterpillars.

In Fernando Po, on the whole, harmful insects are effectively controlled by means of Dieldrin treatment.

In the Canary Islands, Mealy Bug control was undertaken with different pesticides: oil sprays, nicotine, malathion, etc. An insectarium was set up for the multiplication of a natural enemy of the Mealy Bug, Cryptolaemus Montrouzieri (Coccinnellidaea), but it was not possible to demonstrate the efficacity of the latter, because it was destroyed by chemical pesticides.

The delegate of New Zealand said that a pre-treatment of planting material with a mixture of dieldrin and oils gave good results. Scab moth,* the larvae of which cause a serious blemish on the young fruit are at present controlled only by hand dusting. A parasitic wasp, Chalonus, has recently been introduced to Fiji and W. Samoa, for control of the moth.

The delegate of Ghana pointed out that in his country, in some combined banana/cocoa plantations, damage was inflicted on the roots by termites belonging to an underground species that did not build nests in mounds and could not therefore be controlled by standard methods used by INEAC.

* (Nicoleia ectoscima)

(b) Nematodes

The rapporteur drew attention to the fact that it was only quite recently that the extent of damage to banana roots and corms by parasitic nematodes had come to light, and control methods been evolved. The species Radopholus similis was widespread and responsible for 90 to 95 per cent of nematode damage and whenever it happened to be absent, it was generally replaced by equally harmful species.

Mr. B.E.V. Parham introduced the report prepared by Mr. C.A. Loos (No. 15) and was followed by Mr. A. Vilardebo who summarized his work done in this field in collaboration with Mr. M. Luc (No. 19). The representative of the International Potash Institute presented two reports relating to the control of the nematodes found in banana orchards in Israel (Mr. G. Minz, in No. 25 by Mr. R.J. Ticho and No. 44 by Mr. R. Oren).

In answer to a question put by the delegate of Israel, the rapporteur pointed out that Nemagon only acted on the microflora at doses higher than 300 litre per ha. whereas normal doses remained between 30 and 35 litres. The harmful effect on the microflora would be more rapid with D-D and Dibrométhane. In Israel, treatment was carried out at the time of first irrigation following planting, whilst on the West African coast treatment was advised at the actual time of planting. The physical characteristics of the soil only came into play when parasites passed from one root to another, the passage being more difficult in heavy soils. Once root penetration had occurred, the soil properties had no effect on the rate of multiplication of the nematodes.

Mr. A.F. Butler described the nematodes found in Latin America (see R.H. Stover, No. 5) and pointed out that the doses of Nemagon used in that continent were appreciably smaller than those quoted by previous speakers. Mr. A. Vilardebo specified that, all things being equal, the roots of 'Gros Michel' were less infested than those of 'Poyo' and seemed to be more resistant to secondary agents. Nevertheless, the 'Gros Michel' variety was being increasingly replaced by varieties of the 'Cavendish' group, to which the 'Poyo' belonged, and the problem of nematode control might hence become more acute in the future.

Disease control

(a) Panama disease

Dr. Vining C. Dunlap, rapporteur, made a general statement on Panama disease, while the representative of the United Fruit Co. summarized the section of Dr. R.H. Stover's paper relating to banana wilt (No. 5).

Mr. A.F. Butler described the new method used by the United Fruit Co. for obtaining sound planting material: corms and suckers were collected from apparently healthy mats, kept for ten minutes in hot water (131° F.), put in individual containers filled with sterilized soil, then planted in areas thought to be free from the disease.

(b) Sigatoka (leaf spot) disease

Dr. Vining C. Dunlap recalled that the disease was first controlled with large amounts of Bordeaux mixture. The low-volume oil spray method, evolved in Guadeloupe at a later stage, had been the subject of recent experiments in Central America, but it affected both the weight and quality of the fruit adversely. Further trials with concentrated mixtures of copper and thiocarbamates were now being carried out.

Mr. B.E.V. Parham read a paper by Mr. R. Leach (No. 36). Dr. D. Tollenaar stated that in Central America and Surinam, copper treatments were successful against mild attacks, whereas oil treatments proved more efficient against severe infections. Mr. J. Brun introduced two papers prepared by Mr. P. Frossard (Nos. 29 and 30). Dr. Tollenaar then submitted his own study (No. 33). He also mentioned the results of experiments carried out in Ecuador (on the Clementina estate). In this country, very wet weather prevailed for 6 to 8 months, with drier weather during the rest of the year. Sigatoka disease could be efficiently controlled by applying low-volume cupric sprays during the wet season only. When oil sprays were applied in the same way, reinfection took place a month after a treatment was discontinued. Moreover, bananas treated with oil sprays suffered a reduction in leaf area, which adversely affected yields, and for that reason it was preferable not to use oil spray.

Mr. J. Brun replied that the opposite results had been observed in Guinea. This difference could be due to many factors, especially the variety of banana and the type of infection. The ascospore form, which prevailed in Guinea, could be controlled only by spraying oil mixtures, which remained active for three weeks. It was thus difficult to draw conclusions applicable to all countries - a view shared by Dr. Vining C. Dunlap, who pointed out that copper treatments were much less efficient in Jamaica than they were in the Dominican Republic.

The delegate of New Zealand remarked that disease-resistant varieties would be an advantage on small estates where control measures could not be applied. At this point, it was observed that commercial varieties were all more or less susceptible and the specific aim of hybridization work undertaken in Jamaica was to breed bananas with resistance to Panama and Sigatoka diseases. This objective had been reached but the new varieties evolved were unsatisfactory from a commercial point of view. It might be possible, however, to use them for local consumption, and the planting of these varieties would eliminate many sources of the disease.

Mr. A.F. Butler pointed out that phytotoxicity of some oils might account for reductions in the bunch weight (up to 10 per cent), which various speakers had mentioned.

Mr. J. Brun stressed that the method of applying oils was also very important, especially so far as concerned the size of the droplets. He went on to say that, apart from their curative action within intercellular spaces,

the oils sharply reduced the germination of ascospores on the surface of the leaves. This type of action reached maximum efficiency 48 hours after treatment.

Replying to a question from Mr. J. Vasquez (Brazil), he said that the oils could probably be transferred from the leaf to other parts of the plant; this problem was at present under investigation. In conclusion, Mr. Brun observed that methods of cultivation had an influence on the spread of the disease. If the multi-stem system was used, conidial infection could easily occur, whereas in the one-follower system, this source of infection was eliminated at harvesting time and contamination could take place only through ascospores.

(c) Bunchy Top

Mr. B.E.V. Parham summarized his paper on Bunchy Top in Samoa (No. 46).

(d) Other diseases

Dr. Vining C. Dunlap quoted from Mr. R.H. Stover's study (paper No. 5) some data regarding other banana diseases, especially "Moko disease".

Mr. P. Frossard drew attention to the presence on the West African coast of the so-called "Fausse mosaïque" disease which caused black spots to appear on the leaves and led to early defoliation. He added that control measures were now being studied in the Ivory Coast. A few data were also presented on a number of fruit rots occurring in Africa.

Transport and ripening of bananas

The subject was introduced by Mr. R. Deullin (Institut International du Froid - IFAC), who classified this vast field under several headings: post-harvest physiology of the banana, determination of fruit quality in the preclimateric stage, occurrence of diseases during transport and ripening, methods of shipping bananas.

Mr. A.F. Butler introduced papers by Mr. N.E. Holmes (No. 21) and Professor J.B. Biale (No. 23). Mr. J. Brun summarized Mr. D.S. Meredith's study (No. 16). The rapporteur commented upon his own documents (papers Nos. 31, 32 and 43).

In reply to a question from the delegation of Guinea, the rapporteur specified that there existed a good correlation between the pulp/skin ratio and the weight/length ratio; the latter method of measurement, however, was much easier and more accurate. Nevertheless, it only gave indications on fruit development. For quality measurement, a pulp firmness index and a pulp colour scale were used. The rapporteur also described the method used to measure pulp firmness.

In Mr. J. Monnet's view, there existed a correlation between the decrease in pulp firmness and the changes in pulp colour; this correlation, however, varied from one variety of banana to another.

The French delegation asked whether those criteria could not be used for the laying down of processing standards. The rapporteur replied that, in the present state of knowledge, their main object was to simplify the work of experts. The formulation of standards, although very desirable, would require a considerable amount of effort.

All participants recognized the importance of correct handling as a means of reducing losses during transport. In the Ivory Coast, where bunches were handled with great care, practically no losses occurred.

Miscellaneous items

Speaking on behalf of the Association pour l'Africanisation de la Culture Bananière et Fruitière en Côte d'Ivoire, Mr. A. Assamoi submitted his report on the organization of this cooperative (No. 48). In reply to a question put by the delegate of Guinea, he gave additional information on the financing methods adopted.

The delegate of Germany, Dr. Claas, described a mobile machine for extracting fibres from the pseudo-stems. These fibres, which showed high resistance to pulling and decay, could be used for the manufacture of sacks, packing cloth, carpets, twine, and mats. Mr. J. Champion pointed out that similar investigations had been carried out in coastal Africa by IFAC - Guinea. From the economic point of view, however, two factors had to be taken into account. First, the banana plantations had to be concentrated in such a way as to reduce the movement of machinery from one point to another; second, it was necessary to ensure the regular restoration to the soil of mineral and organic elements, a factor which Mr. P. Martin-Prével stressed as being important.

The delegate of Lebanon raised the question of feeding cattle with banana leaves, and the delegation of France mentioned the problem of fruit quality from the point of view of palatability and also transport and ripening properties. These matters can be discussed at the next meeting.

DATE AND PLACE OF NEXT MEETING

The delegates expressed their wish that a second International meeting on banana production be organized in four or five years' time, at a location to be determined later.

LIST OF DOCUMENTS PRESENTED TO THE MEETING

1. FAO:
   Provisional agenda

2. B. Chris EDGALI:
   B.C.U.F. Peasant production of table bananas in the Southern Cameroons

3. V.R. IOMPDEN:
   Some observations on the effect of altitude on time taken to shoot by 'Lacatan' bananas in Jamaica.

4. R.E. OSBORNE:
   Field studies in Jamaica leading to the selection of a commercial disease-resistant banana clone.

5. R.H. STOVER:
   Diseases of the banana plant and their control in Central and South America.

6. Egbert A. TAI:
   Openhandedness of 'Lacatan' banana.

7. F. DUGAIN:
   Les analyses de sol et le "bleu" du bananier. (English summary)

8. F. DUGAIN:
   Un aspect de la fertilité des sols dans la plaine bananière du Cameroun. (English summary)

9. F. DUGAIN:
   Variations de certains éléments du sol en culture bananière intensive. (English summary)

10. G.J. PIQUER:
    Banana growing in Jordan.

11. N.C. THORNTON:
    Production management of 'Gros Michel' bananas.

12. N.C. THORNTON:
    Control of insect pests of the banana in Central and South America and Dominican Republic.

13. C.G. JORDINE:
    Some soil requirements of 'Lacatan' bananas in Jamaica.

14. D.E. BOLAND:
The development of a technique for leaf analysis of banana plants.

15. C.A. LOOS:
Some plant parasitic nematodes, their relationship to diseases of the banana (Musa acuminata) and their control.

16. D.S. MEREDITH:
Chemical control of transport and storage diseases of bananas.

17. L. THROWER:
Banana growing in Derna (Cyrenaica, Libya).

18. N. LENEUF et B. DABIN:
Etude des sols de bananeraies de la Côte d'Ivoire. (not distributed)

19. M. LUC et A. VILARDEBO:
Les nématodes associés aux bananiers dans l'Ouest africain. (English summary)

20. A. PERRAUD et P. de la SOUCHERE:
Tourbes cultivées sous bananeraies et tourbes vierges des marais de l'Agnebi (Côte d'Ivoire).

21. N.E. HOLMES:
The harvesting, transport and ripening of bananas.

22. C. OPPENHEIMER:
The influence of climatic factors on banana growing in Israel.

23. J.B. BIALE:
The postharvest physiology of bananas.

24. R. KHALIDY et G. PIQUER:
Culture de la banane au Liban. (English summary)

25. R.J. TICHO:
The banana industry in Israel.

26. J. MONNET:
Comparaisons de variétés du groupe 'sinensis'. (English summary)

27. J. CHAMPION:
Indications préliminaires sur la croissance du bananier 'Poyo'. (English summary)

28. J. CHAMPION, P. LOSSOIS et J. MONNET:
Les sortes de matériel végétal utilisables en plantations bananières et leur influence sur la végétation et les rendements. (English summary)

29. J. BRUN et P. FROSSARD:
Action des pluies sur l'émission des ascospores de Mycosphaerella musicola et la contamination du feuillage. (English summary)

30. J. BRUN et P. FROSSARD:
Etude sur la possibilité d'attaque simultanée sur l'ensemble du feuillage d'un bananier par Mycosphaerella musicola. (English summary)

31. R. DEULLIN:
Mesure de la qualité de la banane en phase préclimactique. (English summary)

32. R. DEULLIN:
Caractéristiques du système de ventilation d'un navire bananier. (English summary)

33. D. TOLLENAAR:
Effects of copper and oil in the control of Sigatoka banana leaf spot.

34. J. WOLF:
Recent developments in world banana market.

35. J. WOLF:
Development and structure of the world banana market.

36. R. LEACH:
Bordeaux and oil spraying of bananas in Jamaica.

37. H. GUYOT et J. CHAMPION:
Etude sur les racines de bananiers. (English summary)

38. J. MONNET, P. LOSSOIS et J. CHAMPION:
Influence du mode de trouaison sur le rendement d'une bananeraie. (English summary)

39. P. MARTIN-PREVEL, et Mme. R. TISSEAU:
Les éléments minéraux dans le régime des bananes. (English summary)

40. P. MARTIN-PREVEL:
Les éléments minéraux dans le bananier à différents stades de son développement. (English summary)

41. J. CHAMPION, J. MONNET et P. LOSSOIS:
Une expérience de culture annuelle de bananiers. (English summary)

42. A. VILARDEBO:
Mode d'action des insecticides de contact dans la lutte contre Cosmopolites sordidus Germ. Importance pour la conduite de l'expérimentation avec ces produits. (English summary)

43. R. DEULLIN:
Activités du groupe de travail sur le transport des bananes par bateau. Institut international du froid. (English summary)

44. R. OREN:
Nematode control in banana plantations with D.B.C.P. in Israel.

45. J. NOSTI:
Banana growing in Fernando Po island.

46. B.E.V. PARHAM:
Crop protection in Western Samoa: control of bunchy top virus disease of bananas.

47. C.B. RAO, T.B. DASARADHI and Y.Y. RAO:
The banana industry in coastal Andhra Pradesh (India).

48. A. ASSAMOI:
Travaux de l'ASSABAF, organisme professionnel de production bananière.

Note: Further copies of all these publications are not available for distribution from FAO or CCTA. Application should be made to the authors.

In addition various documents were distributed to the participants for information, in particular a report by Cobafruit on Banana and Fruit Production in the Ivory Coast, studies on the Republic of the Ivory Coast prepared by the Ministry of Agriculture and the Information Secretary of State, a soil map of the Ivory Coast at 1/2,000,000 prepared by IDERT (ORSTOM) and two studies on nematode control and zinc deficiency in the banana, prepared by R. Cardenosa Barriga.